Horticulture Series No. 518 January 1983

EVALUATION OF PROCESSING TOMATO BREEDING LINES AND CULTIVARS FOR MECHANICAL HARVESTING AND QUALITY IN 1982

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Tomatoes are the most important processed crop in Ohio with a planting acreage in 1982 of 18 thousand acres and 380,000 ton production. Conditions for harvest the 1982 season were ideal and yield averaged 21 tons per acre. New growing practices, machine harvest-bulk handling and new processing technology require better suited varieties in order that the industry remain competitive with other production areas. This breeding work continues to be directed toward improvement of the whole-canned tomato (whole-pack), and other needs of the smaller canner in relation to this product, as well as development of improved varieties for the larger processor of juice, sauce and paste.

Selection for earliness and improved fruit setting ability, especially during periods of heat stress, is being carried out to reduce the problem of split fruit set so as to broaden and make possible more uniform delivery schedules. With increased direct seeding, greater emphasis is being given to seed germination cold tolerance. Other important characteristics being selected for toward more effective machine harvest and bulk handling include crack resistance, firmness and ability of ripe fruit to store well on the vine for extended periods to allow maximum usable ripe fruit recovery in once-over harvest. Thus, in addition to increased productivity, a major objective is more effective utilization of present yield, especially in regard to factors minimizing losses, due to overripe, rotted and green fruit. To reduce production costs, jointless pedicel (j2) is being incorporated to facilitate machine harvest and allow delivery of fruit free of stems.

Improved quality factors being selected for include: acidity, pH, soluble solids, viscosity, color (crimson fruit color (og^c) and high pigment fruit color (hp)), vitamin C, and especially fruit attributes conditioning efficient lye or steam peeling characteristics and corelessness.

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1. Professor, Professor, Agricultural Technician, Branch Manager, Agricultural Aide. Assistance is acknowledged of Vegetable Crops Branch Staff and the Horticulture Processing-Technology Assistants, OSU-OARDC.

1/83/H-484/450

Recently Released Ohio Varieties

This season there was an increase in commercial acreage planted of the newly released machine harvest cultivar Ohio 7870 for early-main season production. Growers had very good yield results with this new release for hand as well as machine harvest. It was processed into a variety of products with continued good quality results and was found to also lend itself to whole-pack. Ohio 7870 acreage in Ohio as well as surrounding midwestern states and eastern states will increase to several thousand acres in 1983.

Grower-processor results with Ohio 7681 continued good. Commercial yields of 40 tons per acre were reported and commercial pack had good quality. Plantings of over 1000 acres are projected for 1983.

Commercial size seed lots of Ohio 7681 and Ohio 7870 are available from ADI Distributors, Inc., Carmel, Indiana and Castle Seed Co., Morgan Hill, California.

Promising Ohio Advanced Breeding Lines

The advanced Ohio lines 7814, 7825, 8120, 831, 832, and 833 continued their good performance in 1982:

Ohio 7814, an early Fusarium resistant jointless pedicel machine-harvest type with good firmness and holding ability suitable for coreless wholepack and product. There were several hundred acres of trial acreage grown of this line in 1982 with good results and acreage should increase in 1983. Commercial size seed lots are available from ADI Distributors, Inc.

Ohio 7825, an early Fusarium resistant machine harvest type, did well in trial commercial acreage. Firmness, holding ability, productivity and quality were excellent; testing with grower-processors will increase. Commercial seed is available from ADI Distributors, Inc.

Ohio 8129, an early Fusarium resistant, jointless pedicel (j2), machine-harvest type, continued to exhibit potential. It has good firmness and holding ability and is suitable for coreless wholepack and product. The line will be in extensive commercial trial acreage with several processors. Commercial seed is available from ADI Distributors, Inc.

Ohio 831 is also an early-mainseason, Verticillium-Fusarium resistant, machine harvest type line. It is suitable for product or coreless wholepack and will be continued in OARDC and commercial trial.

Ohio 832 is a mainseason Verticillium-Fusarium resistant crimson (og^c) type which has exhibited potential in commercial trials for hand harvest, as well as machine harvest. It is firm and suitable for product or wholepack. It will be continued in OARDC and commercial trial.

Ohio 833 is a mainseason, Verticillium-Fusarium resistant, freestemming line especially adapted to machine harvest and suitable for product and wholepack. It will be continued in OARDC and commercial trial.

New breeding lines are available which exhibit potential for improved productivity and quality over present varieties (Tables 1 and 2). The following advanced lines in particular will be more extensively tested in grower trials and are being used in crosses in further breeding to attain higher levels of productivity and quality: Ohio 79122, 8136, 8243, 8245, 8295, and 8298.

CULTURAL INFORMATION

Location: Vegetable Crops Branch, Fremont, OH.

Plants: Greenhouse-grown, 108 per standard flat from seed sown April 5.

Transplanted to Field: May 25, a two-row transplanter using 21-53-0 starter at 5 lb. per 100 gal. of water; 1/2 pint per plant.

Fertilizer: 800 lb. per acre of 0-26-26, October; 148 lb. per acre of 34-0-0 April 30.

Soil: Silty clay loam, fall bedded November 1981.

Herbicide: Devrinol 1 1/2 lb. ai May 4; Sencor directed spray 0.25 lb. ai June 24; and 0.25 lb. ai July 14.

Plot Size and Spacing: One-row plots, 20 plants per row spaced 12 inches, row 5 feet apart: Trial I, 4 replications; Trial II, 2 replications. NTEP (Northern Tomato Exchange Program) Plots non-replicated with 10 plants/plot.

Insect and Disease Control:

11 June	Copper, Manzate & Guthion
23 June	Copper, Manzate & Thiodan
28 June	Copper, Manzate & Guthion
6 July	Copper & Manzate
12 July	Bravo
19 July	Bravo
26 July	Bravo
1 August	Bravo & Dithane M-22
11 August	Bravo, Benlate & Guthion
24 August	Bravo & Benlate

Weather Data (Fremont, Ohio)

	Temperature		Rainfall (inches)	
	1982	28 Yr.Avg.	1982	28 Yr.Avg.
May	65.4	58.9	5.72	3.39
June	65.6	68.0	4.73	4.05
July	72.3	72.9	2.94	4.02
August	67.5	70.3	1.35	3.60

The weather in May was relatively dry and warm. Through June and July temperatures were below average. July rainfall was adequate but the remainder of the growing season was below average for rainfall negating blight problems and weed growth, but the occurrence of blossom-end-rot and reduced fruit size were of consequence. Harvest conditions were near ideal with generally mild temperatures and dry weather.

Harvest Information

Harvesting was with an FMC Tomato Harvester and was carried out when the entries were estimated to be at a stage of fruit ripeness in which yields of marketable fruit were approaching optimum recovery with a minimum of green and cull fruit (Tables 1 and 4). Percentages reported of fruit recovery are on a weight basis.

QUALITY EVALUATION

Field run tomatoes were used for quality evaluation; the sample was cut in half, quartered, extracted in a Food Processing Equipment Co. Laboratory pulper, and de-aerated. All laboratory samples were harvested by hand on September 13 and evaluated on September 14.

1. Agtron E-5. Instrument calibrated at 48.
2. Hunter D-6 Tomato colorimeter (TCM).
3. Percent Soluble Solids. Abbe Refractometer.
4. Percent total acid as citric. The raw sample used for pH determination was directly titrated using 0.1 normal sodium hydroxide solution to a pH of 8.1.
5. pH was determined by the glass electrode method.
6. Vitamin C (ascorbic acid) standard procedure:

$$\text{Dye factor} \times \text{ml. of dye} \times 100 = \frac{\text{mgs. Vitamin C}}{100 \text{ gms}}$$

TABLE 1. Trial I. Field Evaluation of Processing Tomato Varieties and Test Lines for Mechanical Harvest When Yields of Marketable Fruit Were Approaching Optimum Recovery, Vegetable Crops, Branch, OARDC, Fremont, Ohio 1982.

Variety or Test Line	Seed Source	Ripe Usable Tons/A	Ripe Usable % of Potential	% of Potential Cull	Fruit Size (oz)	Stems %	Stems Joint
Harvest Date 8/26/82							
FME 6203	12	31.7	80	4	3.2	46	+
H 2653	5	27.2	77	13	2.2	1	j2
H 7038	5	27.0	70	10	3.8	83	+
VF 134-1-2	8	26.2	77	5	2.9	47	+
Harvest 9/1/82							
Ohio 7681	1	36.3	72	6	4.6	90	+
Peto 95	8	30.5	78	7	2.7	30	+
Ohio 832	1	30.5	78	7	3.3	67	+
Ohio 7814	1	28.6	81	4	1.9	1	j2
Ohio 8153	1	28.6	76	10	3.2	0	j2
Ohio 831	1	28.5	76	3	3.0	33	+
Ohio 7825	1	27.2	79	6	2.3	63	+
Ohio 8243	1	26.2	82	5	1.9	1	j2
Ohio 8129	1	26.1	84	5	2.0	0	j2
Ohio 8138	1	24.3	77	9	2.6	2	j2
Ohio 8241	1	23.5	78	7	2.3	1	j2
Ohio 8038	1	23.4	76	4	2.7	1	j2
Ohio 8136	1	22.8	77	7	2.6	20	+
Ohio 8245	1	21.5	75	2	2.1	2	j2
C 4135	2	21.2	71	6	2.6	0	j2
Ohio 8137	1	21.1	72	14	3.1	10	j2
Ohio 833	1	20.9	73	6	2.8	29	j2
Ohio 8144	1	20.1	80	2	2.0	2	j2
Harvest Date 9/7/82							
Ohio 7870	1	27.7	84	6	2.5	38	+
H 722	5	27.4	88	3	1.9	0	j2
Ohio 8239	1	25.4	81	8	2.3	1	j2
Purdue 812	11	24.8	78	6	1.6	0	j2
Ohio 79122	1	22.7	72	11	3.1	75	+
US 28	10	14.3	51	19	3.5	4	j2
C 37	3	13.7	56	25	2.7	3	j2
LSD 5%		8.1			0.4		

TABLE 2. Trial I. Laboratory Evaluation of Processing Tomato Varieties and Test Lines, Vegetable Crops Branch, OARDC, Fremont, Ohio 1982.

Variety or Test Line	pH	% Citric acid	% Soluble solids	Color			Vitamin C
				Hunter CDM a/b	Agtron E5	Hunter D6 TCM	
FME 6203	4.42	0.29	5.95	2.31	30	79	38.0
H 2653	4.40	0.23	5.42	2.39	29	73	33.0
H 7038	4.35	0.28	5.70	2.40	29	78	35.5
VF 134-1-2	4.27	0.28	4.51	2.37	30	75	23.1
Ohio 7681	4.28	0.34	6.10	2.39	30	77	36.9
Peto 95	4.39	0.25	4.99	2.36	29	72	28.1
Ohio 832	4.30	0.29	5.48	2.56	28	76	35.8
Ohio 7814	4.23	0.39	5.80	2.32	30	69	33.6
Ohio 8153	4.24	0.31	5.85	2.36	29	75	37.4
Ohio 831	4.28	0.32	5.38	2.43	29	76	29.7
Ohio 7825	4.30	0.33	5.38	2.27	29	72	37.4
Ohio 8243	4.24	0.31	5.50	2.24	30	68	41.3
Ohio 8129	4.25	0.37	5.59	2.58	28	79	32.5
Ohio 8138	4.35	0.33	5.35	2.34	30	73	24.8
Ohio 8241	4.28	0.29	5.85	2.56	30	73	27.0
Ohio 8038	4.21	0.41	5.25	2.36	32	72	27.5
Ohio 8136	4.27	0.38	5.59	2.61	29	78	38.0
Ohio 8245	4.28	0.42	5.38	2.48	29	72	32.5
C 4135	4.28	0.31	5.95	2.27	31	75	42.0
Ohio 8137	4.30	0.34	5.65	2.28	32	74	34.1
Ohio 833	4.20	0.37	5.25	2.50	28	75	28.1
Ohio 8144	4.16	0.35	5.85	2.35	30	73	36.9
Ohio 7870	4.33	0.32	5.25	2.39	29	74	33.6
H 722	4.18	0.28	5.05	2.36	30	73	40.7
Ohio 8239	4.20	0.32	5.70	2.26	30	70	31.9
Purdue 812	4.32	0.40	6.10	2.56	28	77	38.0
Ohio 79122	4.32	0.28	5.25	2.55	29	79	34.1
US 28	4.29	0.39	6.60	2.46	29	74	35.2
C 37	4.18	0.26	5.70	2.24	30	74	33.0

TABLE 3. Trial II. Field Evaluation of Processing Tomato Varieties and Test Lines for Mechanical Harvest When Yields of Marketable Fruit Were Approaching Optimum Recovery, Vegetable Crops Branch, OARDC, Fremont, Ohio 1982.

Variety or Test Line	Ripe Usable Tons/A	Ripe Usable % of Potential	% of Potential cull	Fruit size (oz)	Stems %	Stems joint
Harvest Date 9/1/82						
O 8254	26.6	74	10	3.0	2	j2
O 8267	26.3	68	9	3.1	3	j2
O 8255	22.1	62	10	4.1	10	j2
O 8260	21.1	70	11	3.1	4	j2
O 79116	20.1	78	7	1.8	1	j2
O 8290	19.8	75	7	2.1	1	j2
Harvest Date 9/7/82						
O 7870	24.9	76	5	2.8	35	+
O 8239	24.1	81	7	2.5	0	j2
O 8278	23.8	78	8	2.5	0	j2
O 8243	22.1	80	10	2.0	0	j2
O 8241	22.0	77	9	2.5	0	j2
O 8257	21.8	70	13	2.8	1	j2
O 8295	20.7	80	6	2.5	0	j2
O 8245	17.5	80	5	2.0	0	j2
O 8274	16.4	69	8	2.5	1	j2
C 37	12.6	50	23	3.1	4	j2

TABLE 4. Trial II. Laboratory Evaluation of Processing Tomato Varieties and Test Lines. Vegetable Crops Branch, OARDC, Fremont, Ohio 1982.

Variety or Test Line	pH	% Citric acid	% Soluble solids	Color			Vitamin C
				Hunter CDM a/b	Agtron E5	Hunter D6 TCM	
O 8254	4.30	0.31	5.20	2.29	30	72	27.0
O 8267	4.34	0.25	5.35	2.43	29	74	36.9
O 8255	4.24	0.37	5.35	2.39	31	74	30.3
O 8260	4.30	0.28	5.35	2.51	30	75	31.9
O 79116	4.33	0.36	5.35	2.58	29	78	29.2
O 8290	4.32	0.31	6.41	2.54	29	76	29.7
O 7870	4.29	0.20	5.20	2.41	31	71	35.8
O 8239	4.32	0.33	5.95	2.39	30	71	31.4
O 8278	4.40	0.35	6.40	2.55	29	73	29.7
O 8243	4.19	0.33	6.00	2.28	30	70	41.8
O 8241	4.30	0.29	6.85	2.54	30	73	30.3
O 8257	4.29	0.36	5.35	2.35	30	72	30.3
O 8295	4.19	0.34	5.20	2.41	30	74	31.4
O 8245	4.18	0.43	6.21	2.41	30	71	32.5
O 8274	4.45	0.26	5.25	2.57	28	79	37.4
C 37	4.21	0.43	5.39	2.34	30	74	37.4

TABLE 5. Evaluation of 1982 N.T.E.P. (Northern Tomato Exchange Program), OARDC, Fremont, Ohio (Rating Score: 5 excellent - 1 poor).

NTEP Entry No.	Cultivar	Source	Earliness	Cover	Set Concentration	Fruit Size	Firmness	Separation	Styler scar	Internal color
8201	Ont. 8020	7	3	4	5	4	4	5	3	2
8202	US 81B37	10	1	4	3	3	3	5	3	4
8203	Ont. 8012	7	5	5	3	2	2	5	3	5
8204	NC 118	6	3	5	3	4	4	1	4	2
8205	Md 158	9	4	2	5	2	4	5	3	4
8206	US 81B31	10	5	5	5	4	3	5	5	2
8207	Ohio 8129	1	5	5	5	3	5	5	5	4
8208	Ont. 7924	7	3	4	3	4	4	5	4	4
8209	Ohio 8136	1	5	4	5	4	5	4	5	3
8210	Md 157	9	3	4	5	5	1	5	2	2
8211	US 81B44	10	2	3	3	4	2	5	3	2
8212	Ohio 8038	1	4	4	5	4	4	5	4	4
8213	Md 159	9	2	3	3	3	3	5	3	3
8214	Campbell 37	11	3	3	5	4	4	5	2	3
8215	Ohio 7868	1	3	5	5	5	5	4	5	5
8216	NC 119	6	2	3	5	3	2	1	3	2
8217	PU 811	11	3	5	3	2	2	5	3	3
8218	Ont. 817	7	5	2	5	5	2	5	3	4
8219	NC 116	6	4	3	3	4	2	1	4	3
8220	Ohio 8137	1	4	5	5	4	3	5	5	3
8221	H 7038	5	4	3	4	5	2	1	4	3
8222	PU 812	11	2	4	5	3	4	5	3	2
8223	US 81B75	10	2	5	5	4	3	5	5	3
8224	NC 120	6	3	5	3	3	3	1	5	2
8225	Ont. 812	7	5	3	3	2	2	5	3	3
8226	NC 117	6	3	5	4	3	3	1	3	5

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